

Antibacterial activity of *Diplazium esculentum* (Retz.) Sw

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ABSTRACT

The main objective of this research work is to screen various unexploited plants for their antimicrobial activity as these unexploited or pteridophytic plants are being used ethanomedicinally but, very little work has been done on antimicrobial aspects. So, to explore the efficacy of these plants, the following research has been carried out. Aqueous and alcoholic extracts of the plant parts of *Diplazium esculentum* (Retz.) Sw were tested against the growth of some human and plant pathogenic bacteria like *E.coli*, *Salmonella arizonae*, *Salmonella typhi*, *Staphylococcus aureus*. Near all the extracts were found effective against these bacteria. The positive results so obtained were compared with that of the Tetracycline reference standard antibiotic. It was found that extracts when mixed in equal proportion with the antibiotic were more effective against bacteria than the antibiotic alone.

Key words: Antibacterial activity, *Diplazium esculentum*, Pteridophytes.

INTRODUCTION

Pteridophytes (ferns and fern-allies) have drawn attention of plants lovers and horticulturists since antiquity. They are represented by about 305 genera and more than 1,000 species have been reported from India.^[1] However, a perusal of literature reveals that more than 200 species of pteridophytes are being used by the tribals of different regions of India for the treatment of various ailments like cancer, rheumatism, diabetes, inflammation, convulsant, fertility, diuretic, anthelmintic, aphrodisiac, hepatoprotective, sedative, antipyretic etc. and their antimicrobial properties have been reported.^[2-3] The screening and scientific evaluation of plant extract for their antimicrobial substance may prove beneficial for the mankind. In the present investigation an attempt has been made to test *in vitro* antibacterial activity of *Diplazium esculentum* found in Garhwal region against some human and plant pathogenic bacteria like *E.coli*, *Salmonella arizonae*, *Salmonella typhi*, *Staphylococcus aureus*. *Diplazium esculentum* (Retz.) Sw (Family- Athyriaceae) has creeping and branched rhizome; scales brown, lanceolate and upto 7 to 15 mm in length; stripes fragile, straw coloured, 10-35 cm long, lamina variable, broadly lanceolate to sub-deltoid with acuminate apex, decompositely pinnae and stalked, distantly placed, 6-15 × 2-4.7 cm ascending with

slender, naked, greenish rachides, pinnules, upto 15 × 6 mm, sub deltoid, cut down into ultimate oblong, narrow segments with dentate margin, secondary rachides minutely pubescent, veins forked; sori minute, indusium thin, membranous; spores dark brown.

The plant is common in Uttarakhand region and is frequently used by the Garhwali peoples for medical purpose. The circinate young leaves are used as vegetables (lingra). The rhizome is considered as strong anthelmintic, haemoptysis, used in cough, asthma, phthisis, fever, dyspepsia, stomachache, diarrhea and as antidiarrhetic, insect and pest repellent. Young tips of fronds are used as tonics for health. Decoction of rhizome and young leaves are useful haemoptysis and constipation.^[4-8]

MATERIALS AND METHODS

The specimens of plant were collected from Shyampur, Rishikesh in Uttarakhand region during the month of August and their identity was confirmed by Botanical Survey of India (BSI), Dehradun.

Preparation of Plant Extracts

Fresh plants parts (5 g) were washed 2-3 times with tap water and distilled water and then surface sterilized with 90% alcohol. Subsequently, the plant material was grounded in 50 ml of distilled water and acetone separately for aqueous and alcoholic extracts respectively. The alcoholic macerates were kept for 24 hours at room temperature to evaporate the alcohol. In the remaining residue, 50 ml of distilled

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water was added. Macerates were squeezed through double layer muslin cloth and filtered through filter paper. After filtration, aliquot was centrifuged at 10000 rpm for 20 minutes. The supernatants were filtered through Whatman filter paper and then sterilized by passing through 0.2-micron disposable filters. The extracts (10%) thus obtained were used for the in vitro studies.^[9]

Antibacterial activity of plant extracts

The bacterial cultures were obtained from the GISIPS, Dehradun and maintained on the nutrient agar. The disc diffusion method was used for testing anti bacterial activity.^[10] The media (25 ml) inoculated with suspension of experimental organism was poured in to sterilized petri dishes and left to gel at room temperature. Whatmans filter paper discs (7 mm diameter) were soaked in 0.2 ml aqueous and alcoholic extracts as well as a 10-ppm solution of Tetracycline. The filter discs were placed equidistantly on inoculated media and diffusion of solution were allowed to occur for 30 minutes at room temperature. Petri dishes were incubated at 37°C for 24 hours. Three plates were employed per treatment and the average zone of inhibition was recorded.

RESULT AND DISCUSSION

The rhizome and root extracts inhibited the micro organism growth were as the leaves extract did not show any inhibition. It was observed that the root extract along with antibiotic

showed maximum inhibition against *Salmonella arizonae* than the reference standard alone. The leaves and roots extracts did not show any inhibition against *E.coli*. The aqueous extract of root along with antibiotic has shown higher inhibition against *Staphylococcus aureus* than the antibiotic alone. The rhizome extracts were found to be more effective than antibiotic.

CONCLUSION

It is concluded that antibacterial activity of *Diplazium esculentum* and its active constituents would be helpful in treating various kinds of diseases. Crude extracts and their interaction with different active fractions of the plant are needed to explore the exact mechanism of the interaction among the active phyto constituents. Similarly, the efficacy of crude extracts or polyherbal preparation needed to be studied in vitro to assess their therapeutic utility.

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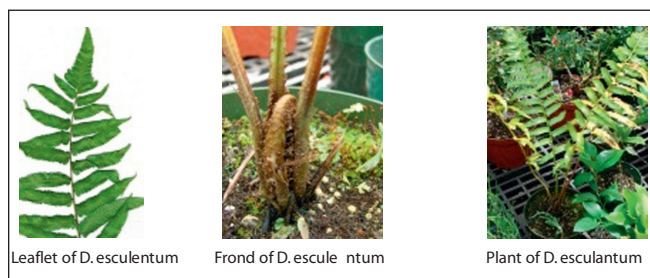


Table 1: Antibacterial activity of plant part extracts of *Diplazium esculentum* by disc diffusion method.

Plant parts	Extracts	Diameter of Inhibition Zone (in mm)				
		<i>E.coli</i>	<i>Salmonella arizonae</i>	<i>Salmonella typhi</i>	<i>Staphylococcus aureus</i>	
Leaves	Extract	Aqueous	00	07	02	00
		Alcoholic	00	09	00	00
	Extract + Antibiotic	Aqueous	20	23	24	24
		Alcoholic	19	19	22	21
Rhizome	Extract	Aqueous	15	05	12	10
		Alcoholic	18	10	11	10
	Extract + Antibiotic	Aqueous	20	18	25	26
		Alcoholic	18	24	24	22
Roots	Extract	Aqueous	10	10	15	15
		Alcoholic	11	12	10	14
	Extract + Antibiotic	Aqueous	22	20	24	24
		Alcoholic	18	20	22	34
Tetracycline (Reference Standard Antibiotic)			22	24	28	24

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